REMARKS

Reconsideration is respectfully requested.

Claims 1-19 are pending in the application. Examiner rejected all claims 1-19 under 35 U.S.C. § 103(a) as being unpatentable over one or more prior art references. In particular, Examiner cited U.S. Patent No. 6,022,800 (Ho) to reject claims 1-4, 7-13, and 16-18; Ho in view of U.S. Patent No. 6,187,631 (Zhao) to reject claims 5-6 and 14-15; and Ho in view of U.S. Patent No. 6,187,631 B1 (Harshfield) or U.S. Patent No. 6,291,346 B1 (Tai) to reject claim 19.

By the present amendment, claims 1, 5, 10, and 14 are amended to overcome these rejections. A marked-up copy of the amended claims is attached hereto.

Claims 1 and 10

As to independent claims 1 and 10, they are amended to include the plasma treatment limitation found in dependent claims 5 and 14. Applicants consider that the amended claims 1 and 10 are now in condition for allowance for the reasons set forth below and respectfully requests an indication of allowable subject matter.

In rejecting claims 5 and 14, Examiner noted, inter alia, that, although neither the admitted prior art nor Ho recites the claimed plasma treatment limitation, among other things, Zhao teaches the plasma treatment limitation, and therefore it would have been obvious to one skilled in the art to include the plasma treatment taught in Zhao.

In addition, it is respectfully submitted that the reliance in the rejections on Ho appears to be misplaced in that passage in Ho relied upon in the rejection, is actually a disclosure of the "prior art" over which Ho teaches an inventive feature. The invention in Ho. is of two separate films 12, 14 deposited by chemical and plasma vapor deposition to form a "barrier layer". See column 3, lines 11-12. Thus, Ho teaches an improvement over that prior art which arguably is described and claimed herein, and thus Ho can be considered to teach against the present invention as claimed.

It is well established that office bears the initial burden of factually supporting any prima facie conclusion of obviousness. MPEP § 2142. One of many requirements for

establishing prima facie obviousness is that the prior art references must teach or suggest all claim limitations. MPEP § 2143.

Applicant respectfully submits that all claim limitations of amended claim 1 or 10 are not taught or suggested in the admitted prior art, Ho, or Zhao, alone or in combination. None of the references discloses the claimed step of treating plasma on the glue layer during the step of forming the glue layer. The support for this limitation is found in the Specification page 10, lines 2-5. In Zhao, a "TDMAT deposition is usually followed by a second step of plasma treating the deposition TiN layer" (col. 4, lines 21-23) and does not teach or suggest the claimed limitation that a glue layer (such as a layer of TiN) can be treated with plasma during the step of forming the glue layer. As to the admitted prior art and Ho, Applicants respectfully agree with Examiner that they do not recite the plasma treatment.

Further, the rejection is required to show in the references themselves that there is some suggestion or motivation to modify the reference or to combine reference teachings. MPEP § 2143. The mere fact that the teaching of the prior art can be modified or combined does not establish a motivation or suggestion to combine and make the resultant combination prima facie obvious. The prior art must suggest the desirability of the combination. MPEP § 2143.01.

However, no motivation or suggestion to combine or modify the Examiner's cited references (i.e., the admitted prior art , Ho, and Zhao) is found in any one of the cited references. Nothing in the admitted prior art or Ho teaches or suggests plasma treatment of a glue layer (such as a layer of TiN), and nothing in Zhao teaches or suggests that such plasma treatment can be performed during the step of forming a glue layer.

For all of the above reasons, independent claims 1 and 10 should be allowed.

Dependent Claims 2-9,11-19

As to dependent claims 2-9 and 11-19, Applicant respectfully submits that the claims are allowable at least since they are dependent on the independent claim either 1 or 10 that is considered to be allowable.

Tai Reference

Applicants respectfully note that Tai issued on September 18, 2001 is not an effective patent reference against the present application that has an earlier priority date based on a Korean application filed on September 5, 2001.

Conclusion

For the reasons set forth above, Applicants respectfully submit that the claims 1-19 pending in this application are in condition for allowance over the art of record. This amendment is considered to be responsive to all points raised in the Official Action. Accordingly, prompt allowance and passage of the application to issue are earnestly solicited. Should the Examiner have any remaining questions or concerns, the Examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application: In Cheol RYU

Serial No.: 10/034,497

Filed: December 29, 2001

For: METHOD OF FORMING A CONTACT FOR A SEMICONDUCTOR DEVICE

GRP ART UNIT: 2814

Ex.: QUACH, T.

CLAIM-MARKED UP VERSION

1. (Once Amended) A method of forming a contact for a semiconductor device, comprising the steps of:

forming a first interlayer dielectric layer on a silicon substrate;

forming a conductive material pattern on a portion of the first interlayer dielectric layer;

forming a second interlayer dielectric layer over the first interlayer dielectric layer and over the conductive material pattern;

forming first and second contact holes by selectively removing the 0second and the first interlayer dielectric layers so as to respectively expose a portion of the conductive material pattern and a portion of the silicon substrate;

forming a glue layer on the first and the second interlayer dielectric layers including over the first and the second contact holes, the glue layer including a CVD TiN layer; [and]

treating plasma on the glue layer using N_2 or H_2, alone or in combination, during the step of forming the glue layer; and

filling the first and the second contact holes with a tungsten layer by forming the tungsten layer on the glue layer.

5. (Once Amended) The method of claim 4, wherein a plasma treatment is further performed [during or] after the deposition of the CVD TiN layer while using N_2 and H_2 gas either together or alone.

10. (Once Amended) A method of forming a contact for a semiconductor device, comprising the steps of:

forming a first interlayer dielectric layer on a silicon substrate;

forming a conductive material pattern on a portion of the first interlayer dielectric layer, wherein the conductive material pattern has a lower etch rate than the first interlayer dielectric layer;

forming a second interlayer dielectric layer over the first interlayer dielectric layer and over the conductive material pattern;

selectively and sequentially removing the second and the first interlayer dielectric layers so as to form first and second contact holes, wherein the second contact hole has a depth greater than the first contact hole, wherein the first contact hole exposes a portion of the conductive material pattern, and wherein the second contact hole exposes a portion of the silicon substrate;

forming at least one CVD TiN layer on the first and the second interlayer dielectric layers including over the first and the second contact holes; [and]

treating plasma on the glue layer using N_2 or H_2, alone or in combination, during the step of forming the glue layer; and

forming a tungsten layer on the CVD TiN layer so as to fill the first and the second contact holes.

14. (Once Amended) The method of claim 13, wherein a plasma treatment is further performed [during or] after the deposition of the CVD TiN layer while using N_2 and H_2 gas either together or alone.